Special Flood Hazard
Evaluation Report

Canaseraga Creek

Town of Grove,
Allegany County, New York

AD-A210 303

Prepared
for the New York State
Department of Environmental Conservation

US Army Corps
of Engineers
Buffalo District

May 1989

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This report documents the results of an investigation to determine the potential flood situation along a portion of Canaseraga Creek within the Town of Grove, New York. The area of study extends along Canaseraga Creek from the Town of Grove corporate limit upstream to where the creek flows under the Conrail railroad bridge above County Road 24. This report also identifies the 100-year floodplain and floodway for 2 miles of the creek.

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SPECIAL FLOOD HAZARD EVALUATION REPORT

CANASERAGA CREEK
TOWN OF GROVE
ALLEGANY COUNTY, NEW YORK

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CANASERAGA CREEK
TOWN OF GROVE
ALLEGANY COUNTY, NEW YORK

INTRODUCTION

This Special Flood Hazard Evaluation Report documents the results of an investigation to determine the potential flood situation along a portion of Canaseraga Creek within the town of Grove, New York. The study was conducted by the Buffalo District, Corps of Engineers at the request of the New York State Department of Environmental Conservation under the authority of Section 206 of the 1960 Flood Control Act, as amended. The area of study extends along Canaseraga Creek from the town of Grove corporate limit upstream to where the creek flows under the Conrail railroad bridge above County Road 24.

The town of Grove is located in Allegany County, approximately 70 miles southeast of Buffalo and 50 miles south of Rochester. It is bordered by the town of Nunda (Livingston County) to the north, the towns of Ossian (Livingston County) and Burns to the east, the town of Birdall to the south, and the town of Granger to the west. The climate of the Genesee Valley is representative of the humid continental type. The basin has cold winters and mild summers. Average temperatures for the months of December, January, and February remain below freezing. Average annual precipitation is 30.44 inches and snowfall averages 57.4 inches per year (Reference 1).

The watershed is characterized by rolling, relatively steep topography with Canaseraga Creek situated in a narrow (2,000-foot wide) valley. The Swain Ski area is located within the study area.

Canaseraga Creek originates in the town of Nunda, then flows south and east through the town of Grove; it then flows in a northerly direction to the town of Geneseo where it flows into the Genesee River.

Knowledge of potential floods and flood hazards is important in land use planning. This report identifies the 100-year floodplain and floodway for about two miles of Canaseraga Creek within the town of Grove. The 100-year floodplain and floodway are shown on the Flooded Area Maps (Plates 3 and 4). The Water Surface Profiles (Plates 1 and 2) show the 100-year flood elevations for the study reach.

The town is experiencing development pressure due to the Swain Ski area. However, the existing Flood Insurance Rate Map for the town does not have enough detail for the town to adequately manage its flood plain program (Reference 2). Information developed for this study will rectify this situation and will be used by local officials to manage flood plain development. It should also be noted that, although the report does not provide solutions to flood problems, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development.

Additional copies of this report can be obtained from the New York State Department of Environmental Conservation until its supply is exhausted, and the National Technical Information Service of the U.S. Department of Commerce, Springfield, Virginia 22161, at the cost of reproducing the report. The Buffalo District Corps of Engineers will provide technical assistance and guidance to planning agencies in the interpretation and use of the data.

PRINCIPAL FLOOD PROBLEMS

No historical flood records exist and the stream is ungaged within the study area so flooding is not well documented. Local residents, however, report that flooding has been a problem within the community. During Tropical Storm Agnes, which occurred in 1972, rainfall was 19 inches (125 year frequency event). There is a gage on Canaseraga Creek located downstream in Dansville; the 100-year discharge at that gage is 12,500 cfs and the drainage area is 153 square miles.

Flood Magnitudes and Their Frequencies

Floods are classified on the basis of their frequency or recurrence interval. A 100-year flood is an event with a magnitude that can be expected to be equaled or exceeded once on the average during any 100-year period. It has a 1.0 percent chance of occurring in any given year. It is important to note that, while on a long-term basis the exceedence averages out to once per 100 years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval. For example, there is a greater than 50 percent probability that a 100-year event will occur during a 70-year lifetime. Additionally, a house which is built within the 100-year flood plain has about a one-in-four chance of being flooded in a 30-year mortgage life.

Hazards and Damages of Large Floods

The extent of damage caused by any flood depends on the topography of the flooded area, the depth and duration of flooding, the velocity of flow, the rate of rise in water surface elevation, and development of the flood plain. Deep water flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles which attempt to cross the flood plain. Generally, water 3 or more feet deep which flows at a velocity of 3 or more feet per second could easily sweep an adult off his feet and create definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Since water lines can be ruptured by deposits of debris and by the force of flood waters, there is the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and flooded sewage treatment plants could result in the pollution of floodwaters and could create health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

HYDROLOGIC ANALYSES

Hydrologic analyses were carried out to establish the 100-year peak discharges for Canaseraga Creek. The upper 14 square miles of the watershed are largely influenced by a pond along Canaseraga Creek. The pond is produced and controlled by a railroad embankment and a low stone levee across the valley.

USGS 7.5 minute quadrangle topographic maps (Reference 3) were used to delineate the drainage basin. The stream was divided into five reaches. Reach 1 begins 700 feet downstream of the Route 408 bridge in Garwoods at the confluence of Canaseraga Creek and an unnamed tributary. It extends 2,000 feet upstream. Reach 2 extends from Station 20+00 upstream to Station 62+00. Reach 3 is located from Station 62+00 to Station 104+00. Reach 4 extends from Station 104+00 upstream to Station 140+00. Reach 5 is located from Station 140+00 upstream to the Conrail railroad bridge at Station 162+00. Reaches 1 and 2 are out of the study area but were used in the hydrologic and hydraulic analysis of the study.

Two methods were used to analyze the 100-year discharge. The first method is a regional regression equation from the U.S. Geological Survey - Water Resources Investigation 79-83 (Reference 4). The second method used was TR-20, developed by the Soil Conservation Service (Reference 5). Results of the two methods were compared. At Station 0, 7,450 feet downstream of the study area, the discharges were comparable. In the lower reaches of the study area, however, the WRI 79-83 method produced unrealistically high depths of flow in the backwater analysis. Because storage has a significant affect on the discharges, and TR-20 has the capability to simulate storage routing, TR-20 was selected as the more appropriate method.

TR-20 is a computerized method that is capable of developing runoff hydrographs, routing hydrographs through channel reaches and reservoirs, and combining or separating hydrographs at confluences. Drainage area, runoff curve number, time of concentration, and anticedent soil moisture condition were input to the TR-20 program. For the upper reaches of the watershed where cross-sectional data were not available, "m" and "x" Att-Kin coefficients were calculated. An elevation-discharge and end-area relationship were determined for each reach. A rating curve was developed f the outflow at the pond and for three culverts at the Route 408 bridge.

Table 1 presents the results of the hydrologic analysis for Canaseraga Creek.

Table 1 - Summary of 100-Year Peak Discharges

Reach	Station	Drainage Area (square miles)	TR-20 100-Year Discharge (cfs)
* 1	0-2000	30.98	5,000
* 2	2000-6200	22.77	2,900
3	6200-10400	21.09	2,800
4	10400-14000	15.95	2,100
5	14000-16200	14.56	1,900

* Reach downstream of study area.

HYDRAULIC ANALYSES

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the 100-year recurrence interval.

Cross-section data for the backwater analysis was obtained from field surveys, USGS topographic maps (Reference 3), and New York State topographic maps with five-foot contours (Reference 6). All bridges and culverts were surveyed to obtain elevation and structural geometry.

Locations of selected cross-sections used in the hydraulic analyses are shown on the Flood Profiles and the Flooded Area Maps where applicable.

Water-surface elevations of the 100-year recurrence interval flood were computed using the COE HEC-2 stepbackwater computer program (Reference 7). A starting water surface elevation for Canaseraga Creek was determined using normal depth, approximately 1000 feet downstream of the Burns/Grove town line.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgement and based on field observations of the stream and floodplain areas. The channel "n" values ranged from .02 to .04, and overbank values, from .04 to .10. Contraction and expansion coefficients ranged from .1 to.3 for contraction and .3 to .5 for expansion of flows.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profile are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Floodway encroachments were computed for Canaseraga Creek from the downstream study limit to upstream of the Conrail railroad bridge near the lake. At various sections along Canaseraga Creek, encroachments were made based on local considerations for future development. Specific areas include the right bank upstream of the railroad bridge from Station 104+00 to Station 110+00 and from the County Road 24 bridge to approximately 500 feet upstream of the County Road 24 bridge. The results of the floodway computations are tabulated for selected cross sections and are shown on Table 2 - Floodway Data. The computed floodway is also shown on the Flooded Area Maps, Plates 3 and 4. In cases where the floodway and the 100-year flood plain boundaries are either close together or collinear, only the floodway boundary is shown.

All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Elevation reference marks used in this study are shown on Plates 3 and 4; the descriptions of the marks are presented in Table 3 - Elevation Reference Marks.

Table 3 - Elevation Reference Marks

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	1278.00	USC&GS BM Z-131, located 0.85 miles northwest of Route 408 along Conrail railroad at Garwoods - Disk in top of northeast culvert headwall at northwest end.
RM 2	1300.05	Chiseled + (yellow) on downstream top of 9' diameter culvert located at County Road 24 bridge in Grove.

UNIFIED FLOOD PLAIN MANAGEMENT

Historically, the alleviation of flood damage has been accomplished almost exclusively by the construction of protective works such as reservoirs, channel improvements, and floodwalls and levees. However, in spite of the billions of dollars that have already been spent for construction of well-designed and efficient flood control works, annual flood damages continue to increase because the number of persons and structures occupying floodprone lands is increasing faster than protective works can be provided.

Recognition of this trend has forced a reassessment of the flood control concept and resulted in the broadened concept of unified flood plain management programs. Legislative and administrative policies frequently cite two approaches: structural and nonstructural, for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as dams and channel work. "Nonstructural" is usually intended to include all other adjustments in the way society acts when occupying or modifying a flood plain (e.g., regulations, floodproofing, insurance, etc.). Both structural and

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
A	6420	170	571	4.9	1279.4	1279.4	1279.6	0.2
B	7750	78	385	7.3	1283.2	1283.2	1283.9	0.7
C	10000	66	436	6.4	1295.2	1295.2	1296.0	0.8
D	10800	95	552	3.8	1296.8	1296.8	1297.5	0.7
E	12400	89	843	2.5	1302.6	1302.6	1303.4	0.8
F	14000	400	3435	0.6	1302.7	1302.7	1303.6	0.9
G	15800	170	887	2.1	1302.7	1302.7	1303.7	1.0

1. Distance in feet measured from confluence (approximately 700 feet downstream of NYS Route 408 bridge in Garwoods) with Canaseraga Creek tributary.

TABLE

TOWN OF GROVE, NEW YORK
ALLEGANY COUNTY

FLOODWAY DATA

CANASERAGA CREEK

nonstructural tools are used for achieving desired future flood plain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, economically undesirable, or unwise use of the flood plain. Responsibility for implementing such actions rests largely with the non-Federal sector and primarily at the local level of Government.

These actions include restrictions in the mode and the time of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, absorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between flood plains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce. Implementing mechanisms for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems. Different tools may be more suitable for developed or underdeveloped flood plains or to urban or rural areas. The information contained in this report is particularly useful for the preparation of flood plain regulations.

a. Flood Plain Regulations.

Flood plain regulations apply to the full range of ordinances and other means designed to control land use and construction within floodprone areas. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment line statutes, open area regulations, and other similar methods of management which affect the use and development of floodprone areas.

Flood plain land use management does not prohibit use of floodprone areas; to the contrary, flood plain land use management seeks the best use of flood plain lands. The flooded area maps and the water surface profile contained in this report can be used to guide development in the flood plain. The elevations shown on the profile should be used to determine flood heights because they are more accurate than the outlines of flooded areas. It is recommended that development in areas susceptible to frequent flooding adhere to the principles expressed in Executive Order 11988 - Floodplain Management, whose objective is to "...avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains ... wherever there is a practicable alternative." Accordingly, development in areas susceptible to frequent flooding should consist of construction which has a low damage potential such as parking areas and golf courses. High value construction such as buildings should be located outside the flood plain to the fullest extent possible. In instances where no practicable alternative exists, the land should be elevated to minimize damages. If it is uneconomical to elevate the land in these areas, means of floodproofing the structures should be given careful consideration.

b. Development Zones.

A flood plain consists of two useful zones. The first zone is the designated "floodway" or that cross sectional area required for carrying or discharging the anticipated flood waters with a maximum 1-foot increase in flood level (New York State standard). Velocities are the greatest and most damaging in the floodway. Regulations essentially maintain the flow-conveying capability of the floodway to minimize inundation of additional adjacent areas. Uses which are acceptable for floodways include parks, parking areas, open spaces, etc.

The second zone of the flood plain is termed the "floodway fringe" or restictive zone, in which inundation migh occur but where depths and velocities are generally low. Although not recommended if practicable alternatives exist, such areas can be developed provided structures are placed high enough or floodproofed to be reasonably free from flood damage during the 100-year flood. Typical relationships between the floodway and floodway fringe are shown in Figure 1. The floodway for Canaseraga Creek has been plotted on the Flooded Area Maps, Plates 3 and 4.

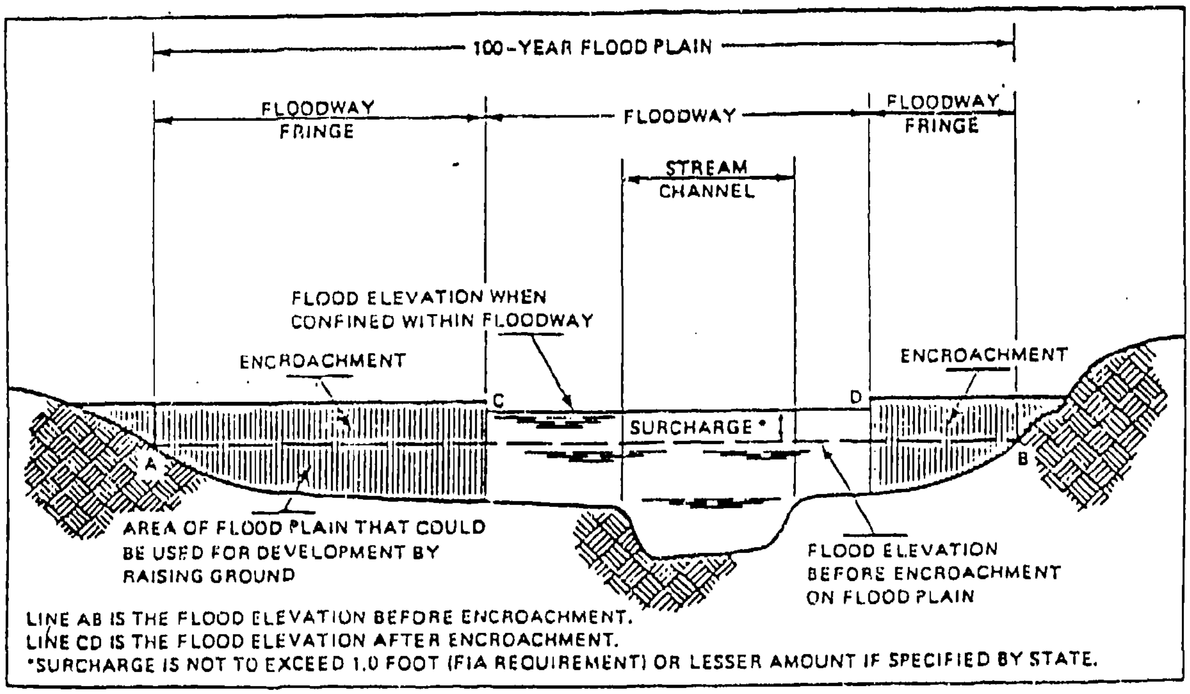

FIGURE 1 - FLOODWAY SCHEMATIC

c. Formulation of Flood Plain Regulations

Formulation of flood plain regulations in a simplified sense involves selecting the type and degree of control to be exercised for each specific flood plain. In principle, the form of the regulations is not as important as a maintained adequacy of control. The degree of control normally varies with the flood hazard as measured by depth of inundation, velocity of flow, frequency of flooding, and the need for available land. Considerable planning and research is required for the proper formulation of flood plain regulations. Where formulation of flood plain regulations is envisioned to require a lengthy period of time during which development is likely to occur, temporary regulations should be adopted to be amended later as necessary.

Modify Flooding

The traditional strategy of modifying floods through the construction of dams, dikes, levees and floodwalls, channel alterations, high flow diversions and spillways, and land treatment measures has repeatedly demonstrated its effectiveness for protecting property and saving lives, and it will continue to be a strategy of flood plain management. However, in the future, reliance solely upon a flood modification strategy is neither possible nor desirable. Although the large capital investment required by flood modifying tools has been provided largely by the Federal Government, sufficient funds from Federal sources have not been and are not likely to be available to meet all situations for which flood modifying measures would be both effective and economically feasible. Another consideration is that the cost of maintaining and operating flood control structures falls upon local governments.

Flood modifications acting alone leave a residual flood loss potential and can encourage an unwarranted sense of security leading to inappropriate use of lands in the areas that are directly protected or in adjacent areas. For this reason, measures to modify possible floods should usually be accompanied by measures to modify the susceptibility to flood damage, particularly by land use regulations.

Modify the Impact of Flooding on Individuals and the Community

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in the preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, purposeful transfer of some of the individual's loss to the community by reducing taxes in floodprone areas, and the purchase of Federally subsidized flood insurance.

The distinction between a reasonable and unreasonable transfer of costs from the individual to the community can also be regulated and is a key to effective flood plain management.

CONCLUSION

This report presents local flood information for Canaseraga Creek in the town of Grove, New York. The U.S. Army Corps of Engineers, Buffalo District, will provide interpretation in the application of the data contained in this report, particularly as to its use in developing effective flood plain regulations. Requests should be coordinated with the New York State Department of Environmental Conservation.

GLOSSARY

BACKWATER	The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.
BASE FLOOD	A flood which has an average return interval in the order of once in 100 years, although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed. It is commonly referred to as the "100-year flood."
DISCHARGE	The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).
FLOOD	An overflow of lands not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary and the lands are adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water. Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, and rise of groundwater coincident with increased streamflow.
FLOOD CREST	The maximum stage or elevation reached by floodwaters at a given location.
FLOOD FREQUENCY	A statistical expression of the percent chance of exceeding a discharge of a given magnitude in any given year. For example, a <u>100-year flood</u> has a magnitude expected to be exceeded on the average of once every hundred years. Such a <u>flood</u> has a 1 percent chance of being exceeded in any given year. Often used interchangeably with <u>RECURRENCE INTERVAL</u>.
FLOOD PLAIN	The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

FLOOD PROFILE	A graph showing the relationship of water surface elevation to location; the latter generally expressed as distance upstream from a known point along the approximate centerline of a stream of water that flows in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.
FLOOD STAGE	The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.
FLOODWAY	The channel of a watercourse and those portions of the adjoining flood plain required to provide for the passage of the selected flood (normally the 100-year flood) with an insignificant increase in the flood levels above that of natural conditions. As used in the National Flood Insurance Program, floodways must be large enough to pass the 100-year flood without causing an increase in elevation of more than a specified amount (1 foot in most areas).
RECURRENCE INTERVAL	A statistical expression of the average time between floods exceeding a given magnitude (see FLOOD FREQUENCY).

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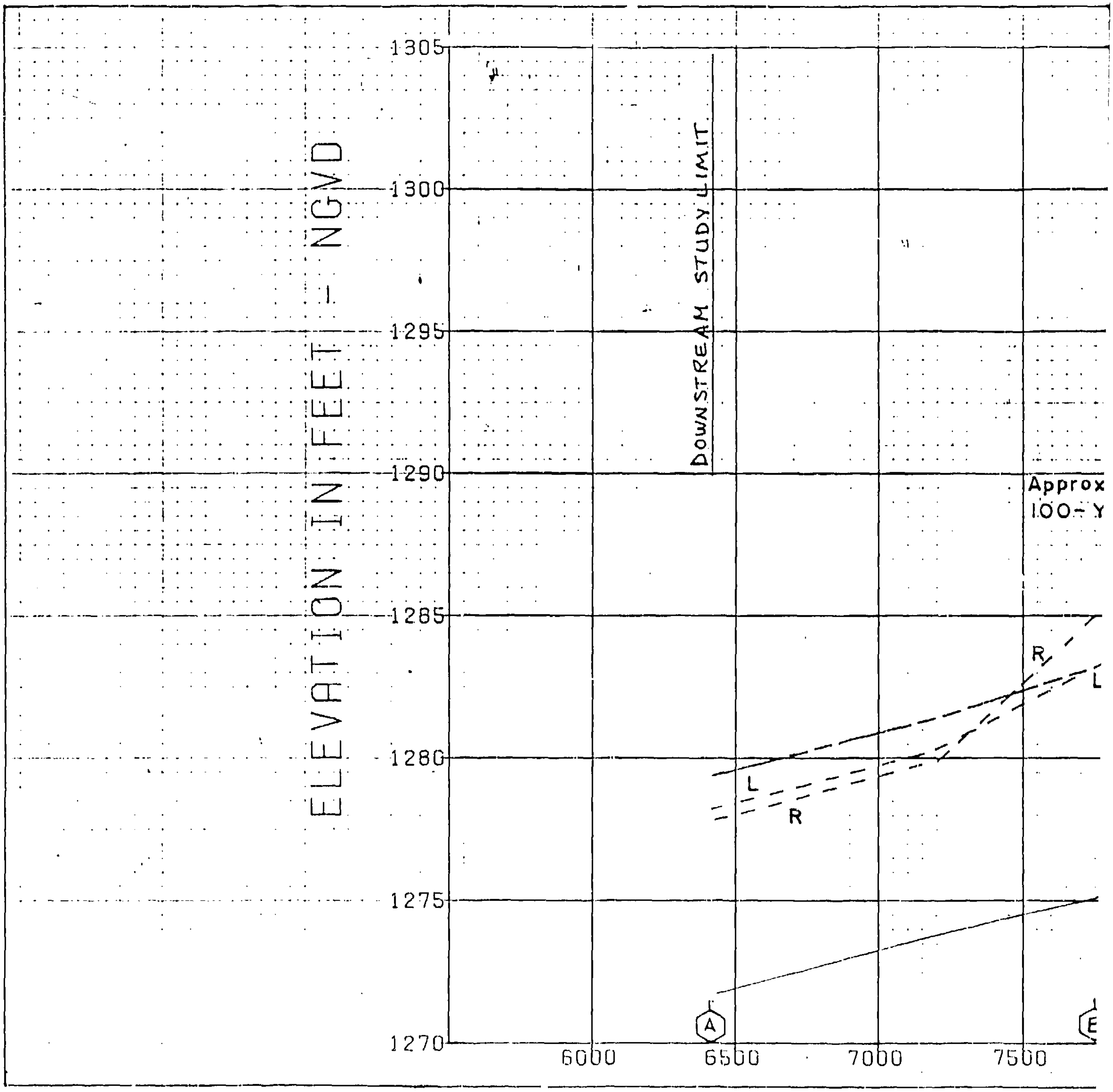

LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

CROSS SECTION LOCATION

BRIDGE

R/L RIGHT/LEFT TOP OF BANK

NOTE: Distance is
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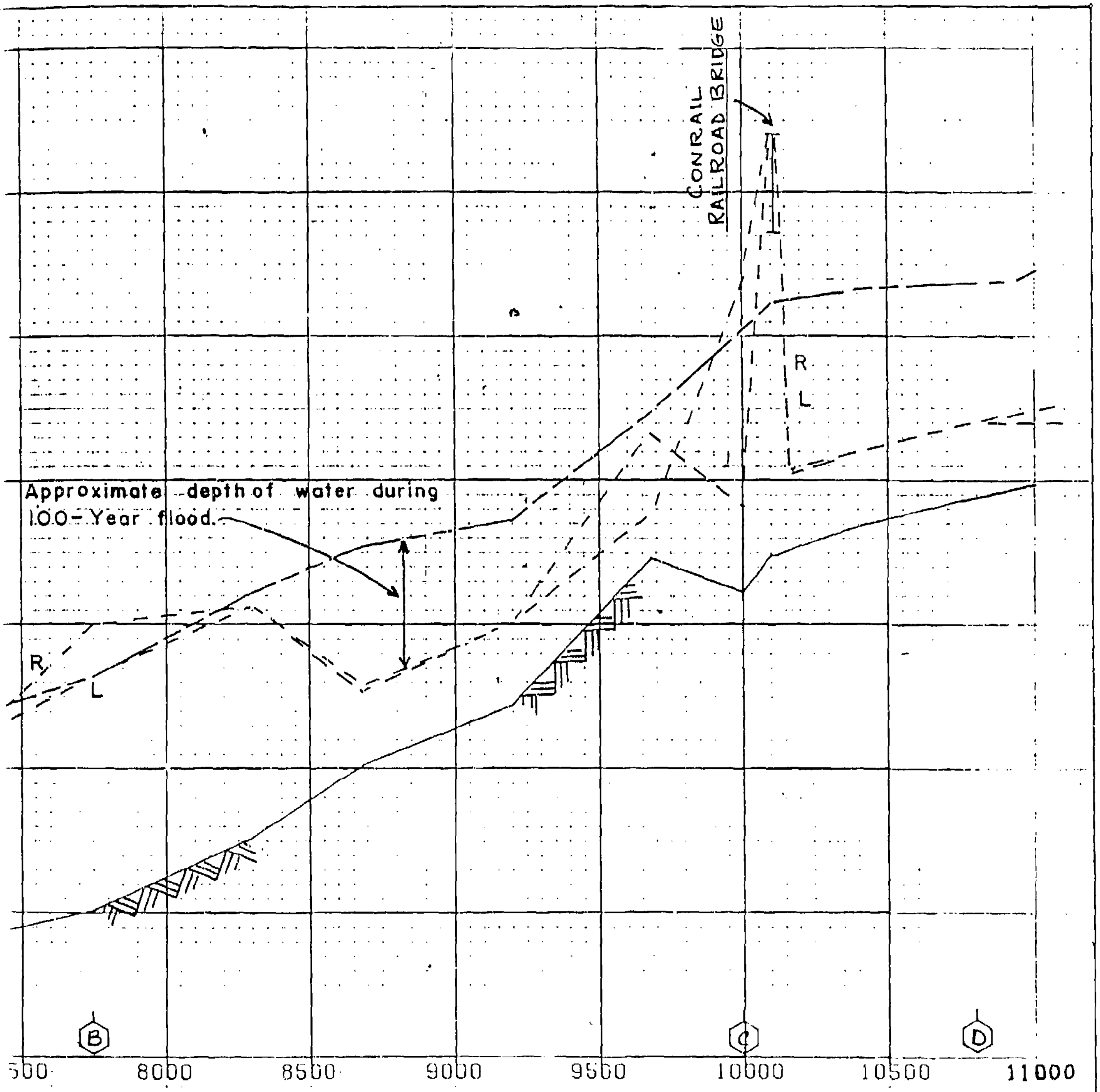
Rte 408 bri
Canaseraga



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roximately 700 feet downstream of NYS
408 bridge in Garwoods) with tributary to
seraga Creek.

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE

CANASERAGA CREEK
GROVE, NEW YORK

PLATE 1 MAY 1989

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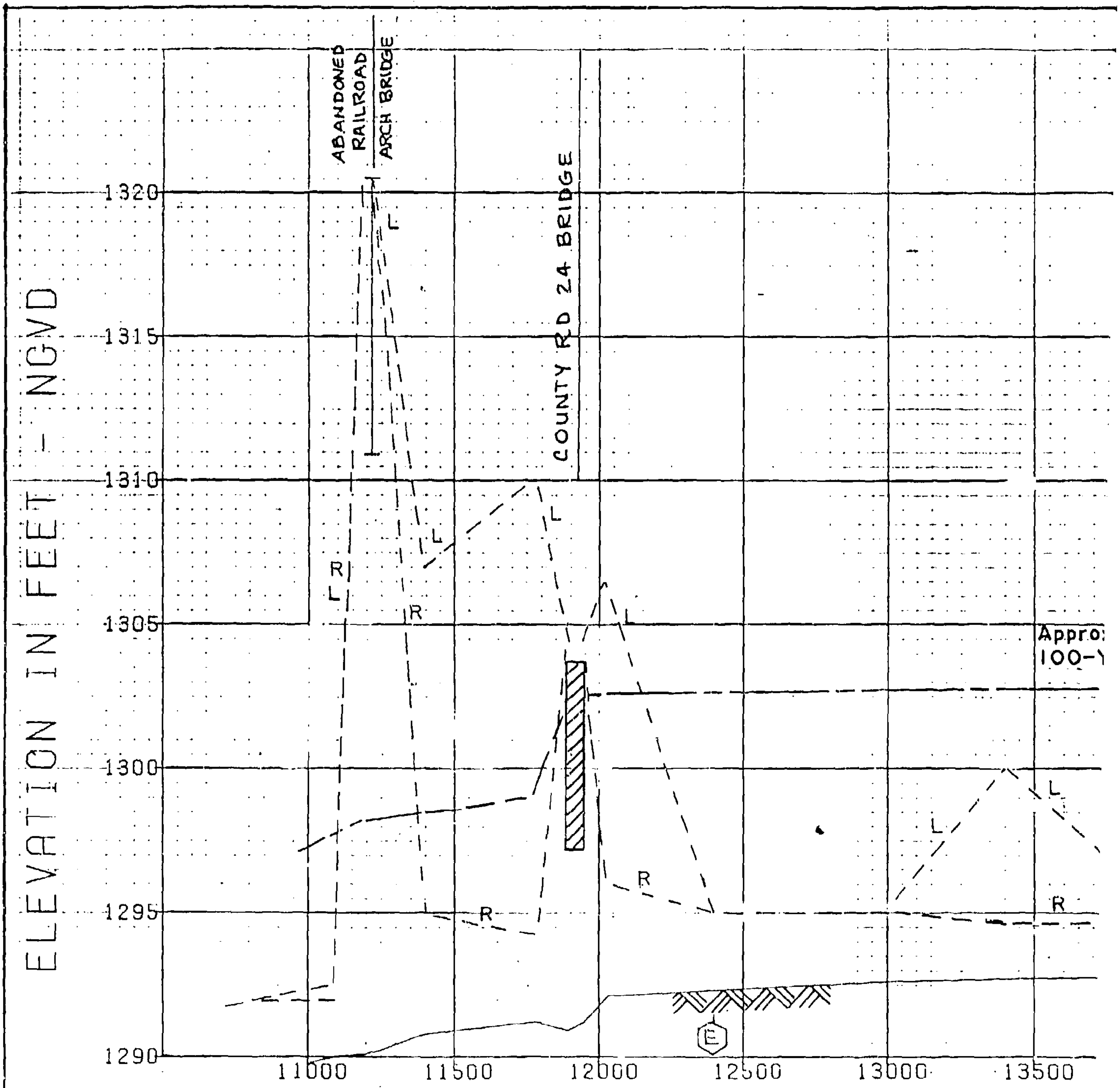

LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

CROSS SECTION LOCATION

BRIDGE

CULVERT

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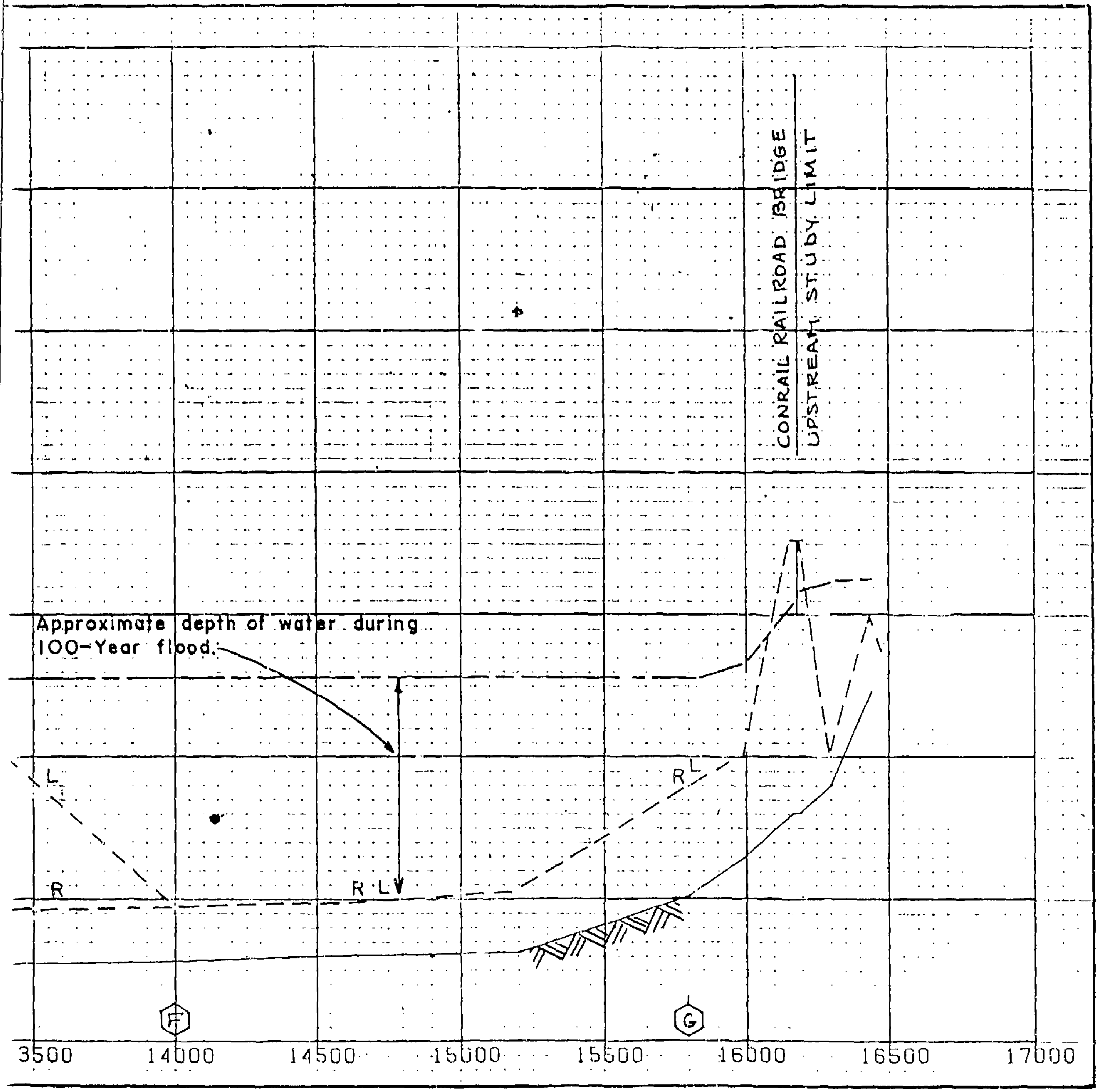

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408 bridge in Garwoods) with tributary to
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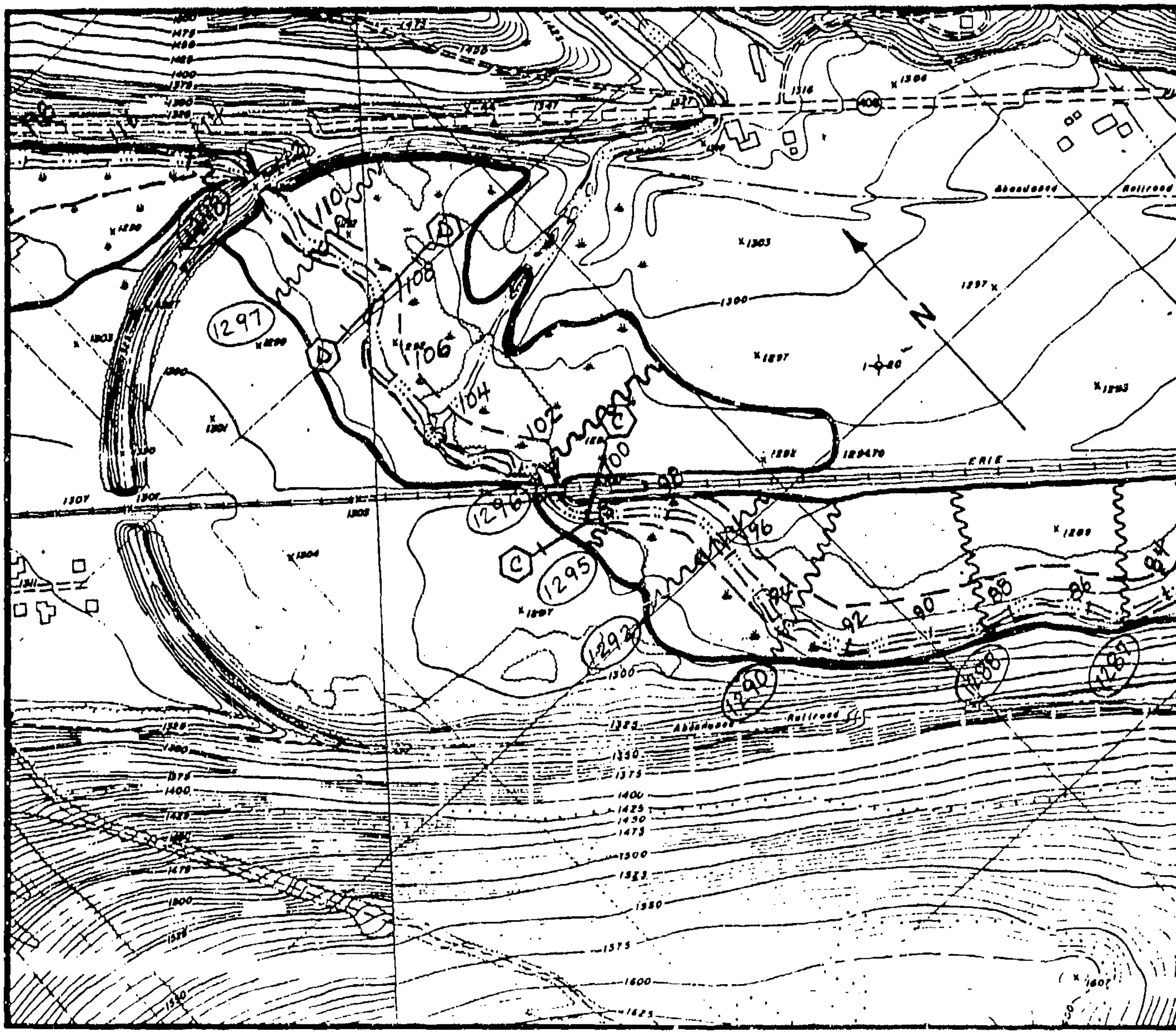
U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE

CANASERAGA CREEK
GROVE, NEW YORK

PLATE 2 MAY 1989

MATCHES PLATE 4



LEGEND

100-YEAR FLOOD BOUNDARY

FLOODWAY LIMITS

BASE FLOOD ELEVATION

CROSS SECTION LOCATION

RM 1 ELEVATION REFERENCE MARK

NOTE: Distance is measured ir
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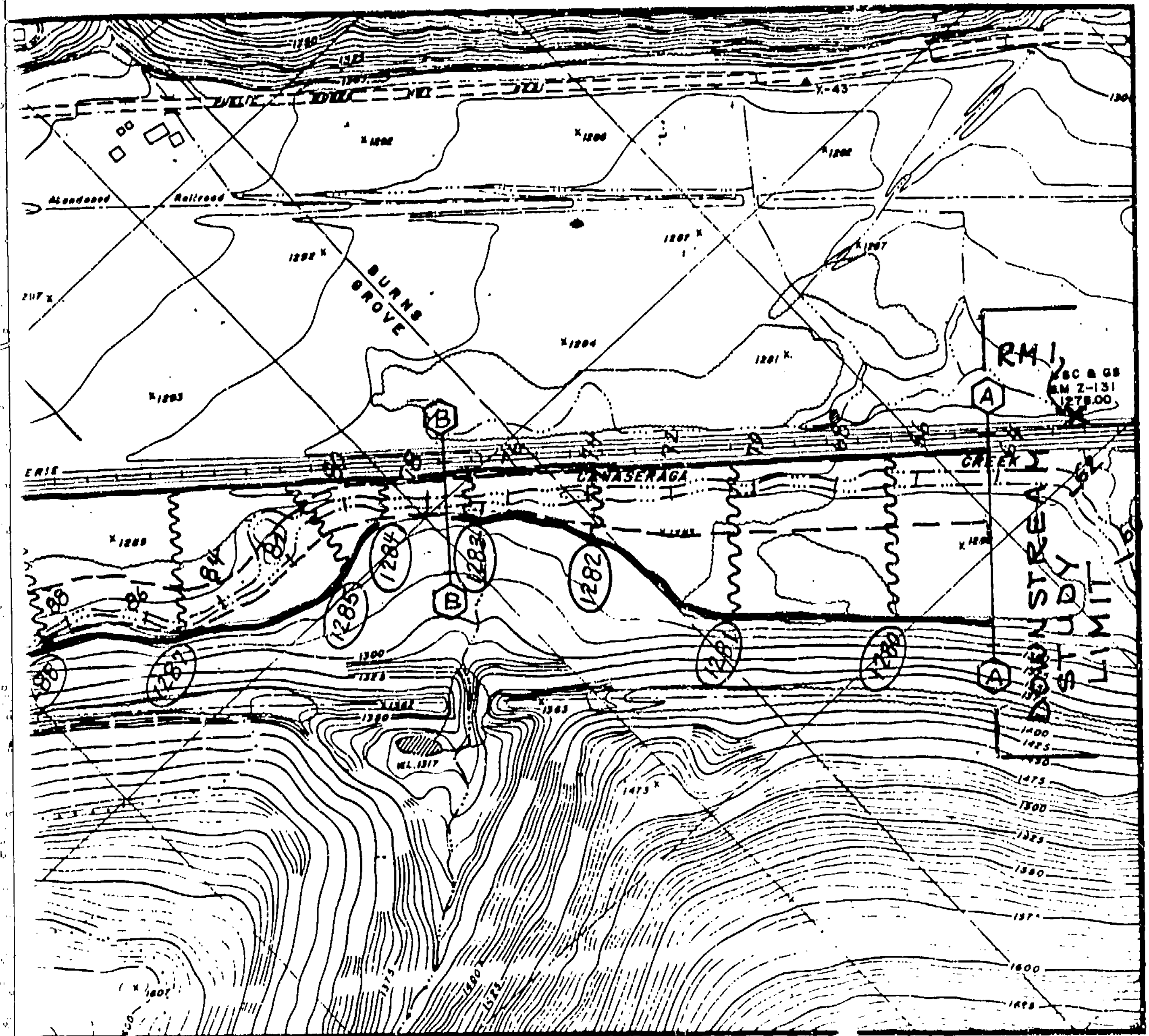
SCALE

400



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SCALE IN FEET

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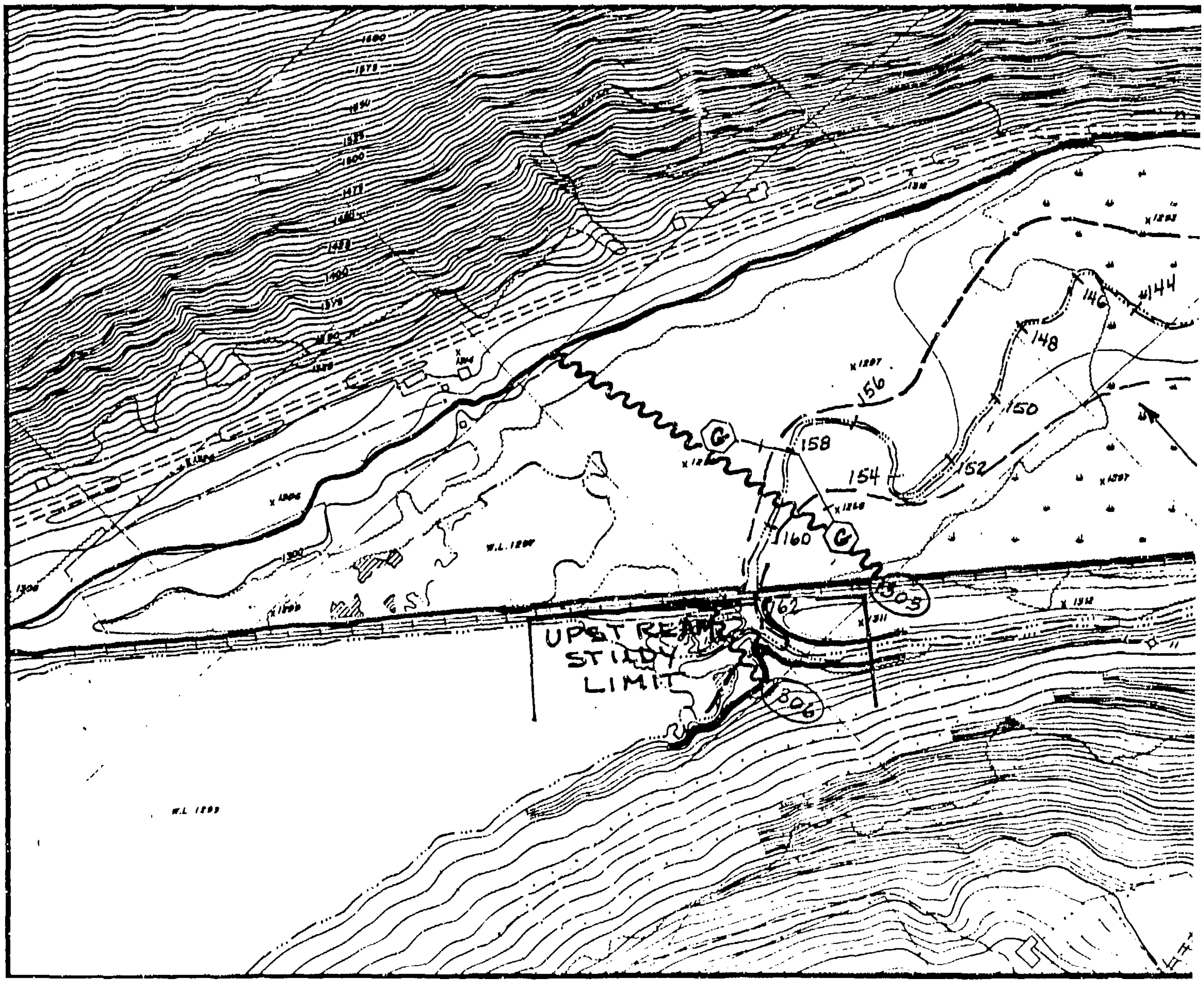
U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS
CANASERAGA CREEK
GROVE, NEW YORK

PLATE 3 MAY 1989



LEGEND

100-YEAR FLOOD BOUNDARY

FLOODWAY LIMITS

BASE FLOOD ELEVATION

(A)——(A) CROSS SECTION LOCATION

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NOTE: Distance is measured in hun
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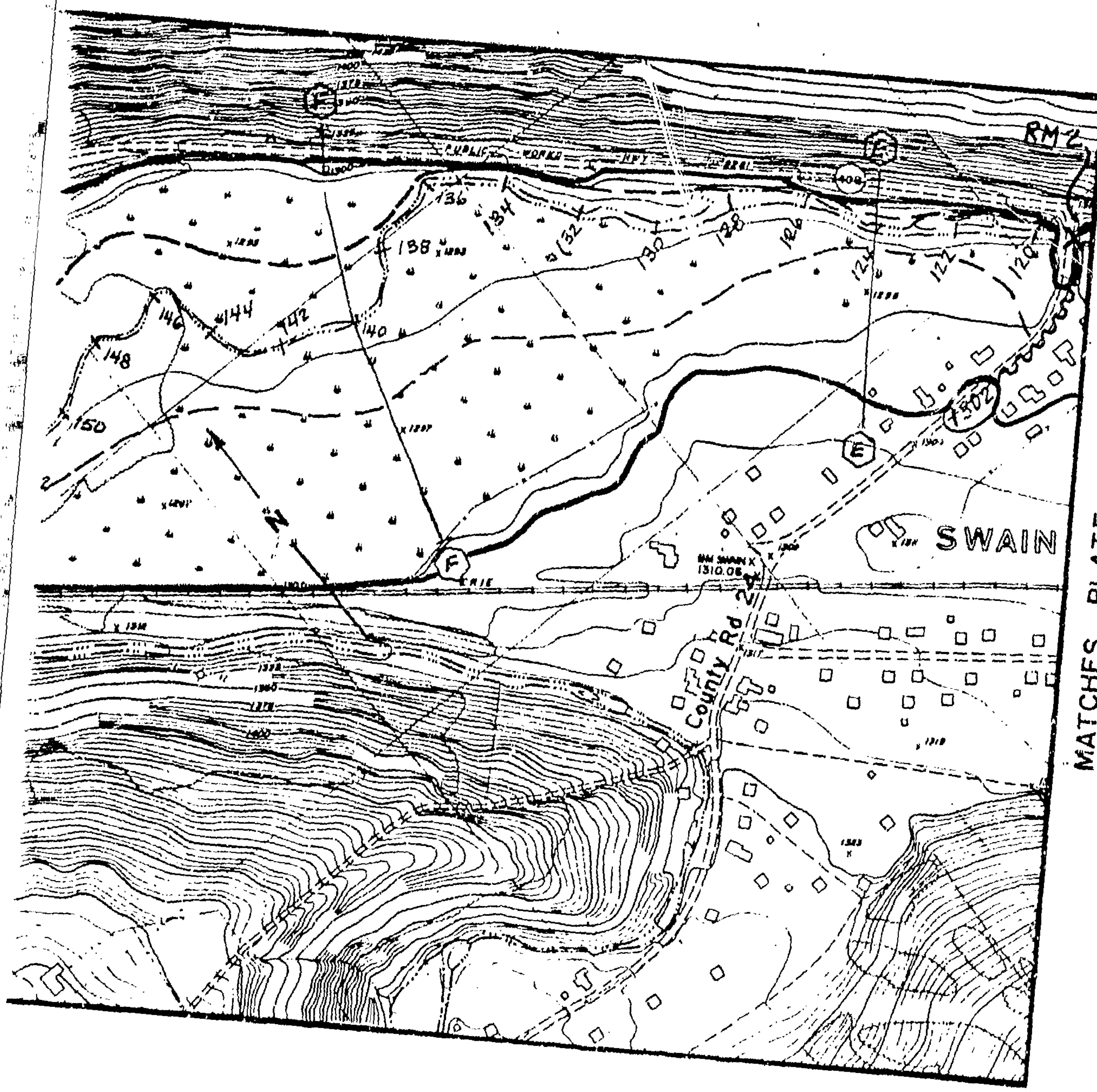

s measured in hundreds of feet from confluence
'ary to Canaseraga Creek (approximately
downstream of NYS Rte 408 bridge
ıods).

SCALE IN FEET

400 0 400

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS
CANASERAGA CREEK
GROVE, NEW YORK

PLATE 4

MAY 1989